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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/521,984	08/18/2005	Holger Thiebert	THIELERT -4 PCT	1926
25889	7590	12/31/2009	EXAMINER	
COLLARD & ROE, P.C. 1077 NORTHERN BOULEVARD ROSLYN, NY 11576			WU, IVES J	
			ART UNIT	PAPER NUMBER
			1797	
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			12/31/2009	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/521,984	<b>Applicant(s)</b> THIELERT, HOLGER	
	<b>Examiner</b> IVES WU	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 October 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-2,4-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-2,4-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

(1). Applicant's Remarks filed on 10/30/2009 has been received.

Claims 3 is cancelled.

The rejections of claims 1-2, 4-6 in prior Office Action dated 7/29/2009 is withdrawn in view or present Remarks.

However, a new ground of rejection for claims 1-2, 4-6 is introduced in the following.

#### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

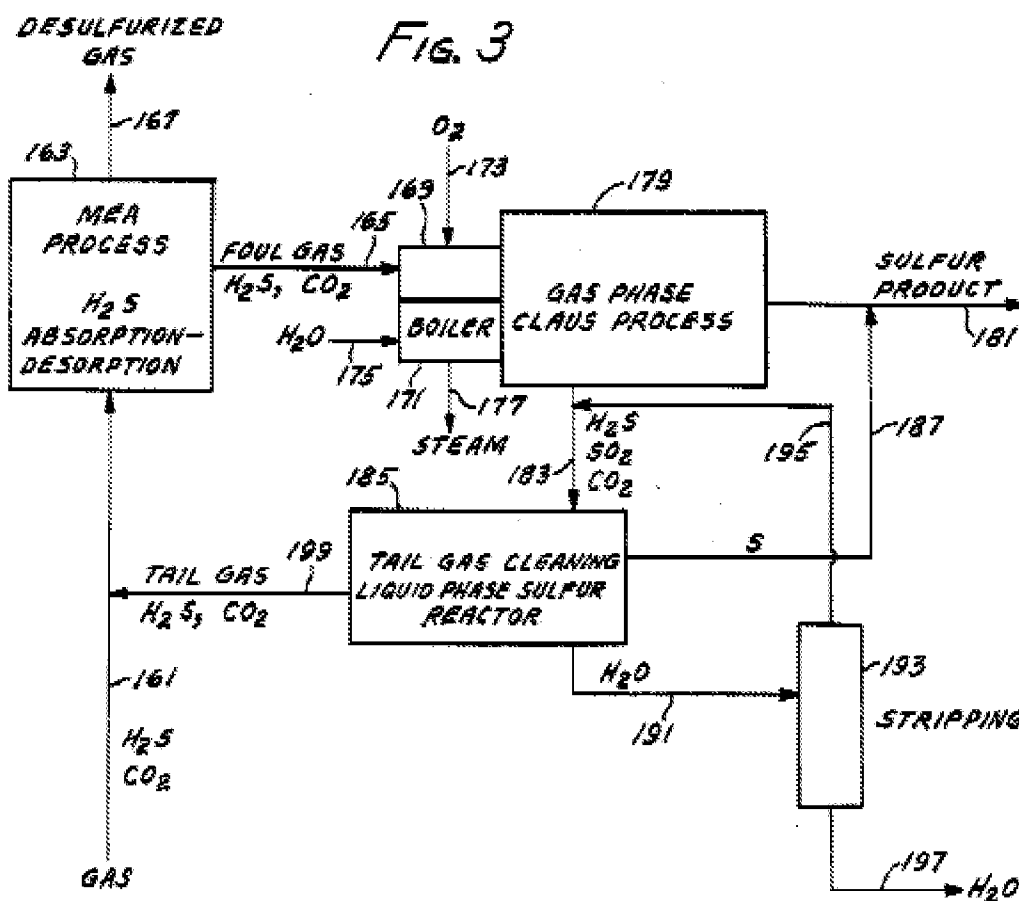
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(2). **Claims 1-2, 4-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tarhan et al (US 4124685), in view of Hyde (US 4940081), evidenced by Luinstra et al (GB 2221853A).

As to method for isolating hydrogen sulfide from coke oven gas with subsequent recovery of elemental sulfur in a Claus plant, in which the hydrogen sulfide is removed from the coke oven gas by means of gas scrubbing, using an absorption liquid, the charged absorption liquid is regenerated and, in this connection, hydrogen sulfide that accumulates in concentrated form is passed to the Claus plant in **independent claim 1**, Tarhan et al (US 4124685) disclose method for substantially complete removal of hydrogen sulfide from sulfur bearing industrial gases (Title). Industrial gases such as coke oven gas, natural gas and various artificially-produced fuel gases are used either by industrial plants to make useful products or burned in suitable combustion apparatus to produce heat (Col. 1, line 15-19). Hydrogen sulfide is

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substantially completely removed from a sulfur bearing industrial gas stream by absorbing the  $H_2S$  into a liquid absorbent, stripping the absorbent of absorbed  $H_2S$  (Abstract, line 1-4). As shown in the Figure 3 below, it illustrates the Claus plant as well as MEA process.

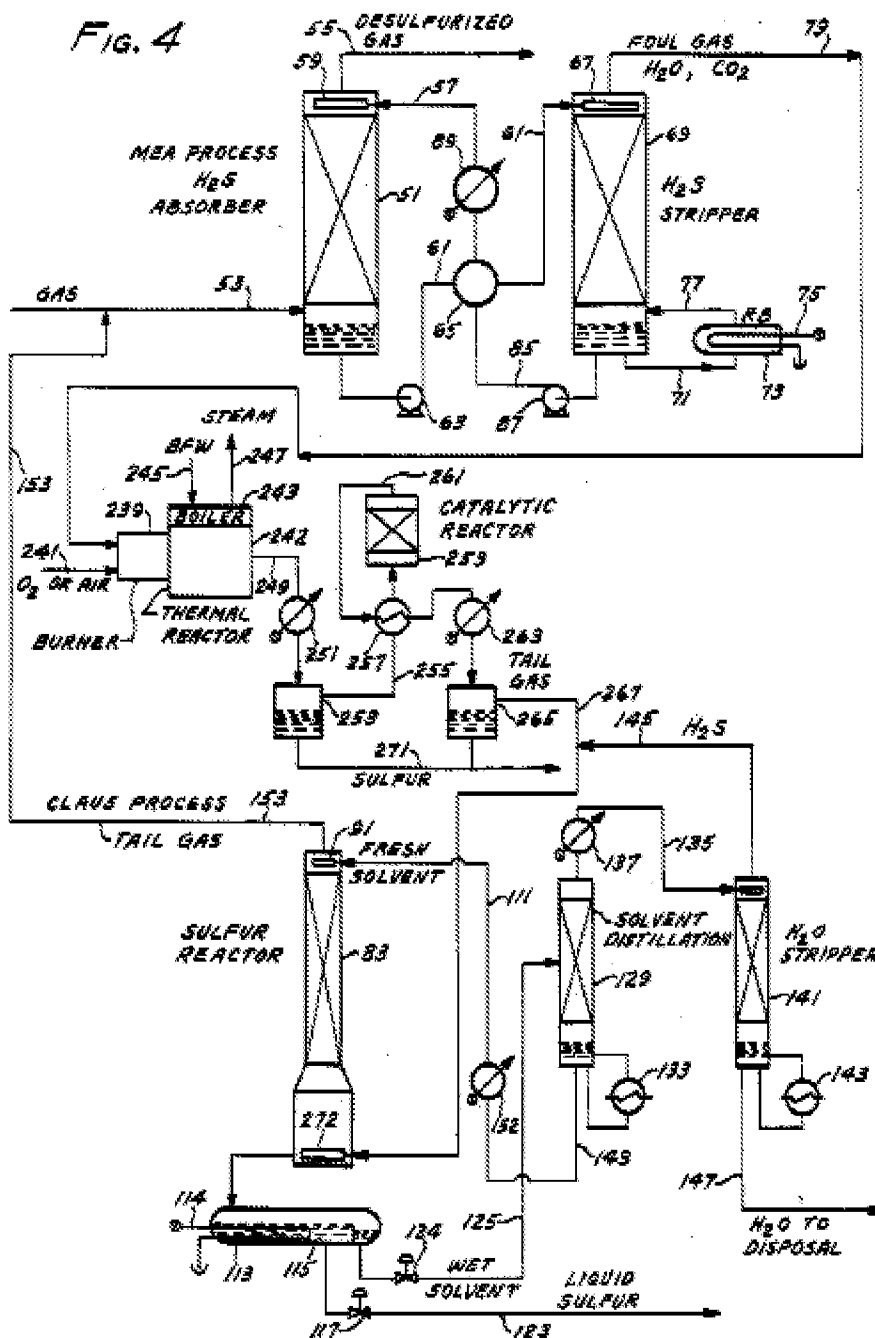


As to hydrogen sulfide being reacted with oxygen in the air, in a Claus boiler of the Claus plant, forming elemental sulfur in the method in **independent claim 1**, Tarhan et al (US 4124685) disclose, after thermal regeneration of the absorbing solution in the absorption-desorption unit 163, the regenerated foul gas, which will have relatively higher content of  $H_2S$  than the original gas is passed through the line 165 into a partial oxidation unit 169 associated with a Claus type sulfur reactor 179. A boiler 171 is also associated with the oxidation unit 169. Oxygen or air enters the oxidation unit 169 through a line 173 and combines with the  $H_2S$  and other combustible gas passing into the oxidation unit from line 165. Only sufficient oxygen or air

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is provided to oxidize a portion of  $\text{H}_2\text{S}$  to  $\text{SO}_2$  in order to maintain the mol ratio of  $\text{H}_2\text{S}$  to  $\text{SO}_2$  in the gas greater than the stoichiometric reaction ratio of 2 (Col. 17, line 26-38).

As to the process gas leaving the Claus boiler to be cooled to the temperature required for condensation of the sulfur, in a waste heat boiler, heated after the sulfur has been precipitated, and passed to a reaction oven of the Claus plant, in which sulfur compounds are converted to elemental sulfur on the catalyst wherein the process gas that leaves the reaction oven is cooled to a temperature required for condensation of sulfur, and the condensed sulfur is precipitated in the method in **independent claim 1**, Tarhan et al (US 4124685) disclose the Claus reaction maybe conducted either in gas phase by mixing the two gases in appropriate apparatus, in which case the process is usually referred to either as Claus process or a gas phase sulfur recovery process, or the reaction may be conducted in liquid phase (Col. 2, line 3-8). The amount of this remaining sulfur can be decreased by subsequent processing, for example, by use of several Claus type reactors in series (Col. 2, line 33-35). A number of processes have been proposed as “clean-up” processes for further treatment of Claus unit tail gas including the use of improved catalysts in Claus reactor (Col. 3, line 46-53). As shown in Figure 4 below, which shows heat exchangers 251, 263, condensed sulfur 271 and catalytic reactor 259.



As to the Claus plant being operated with only a single reaction oven, and that a working temperature of less than 250°C is set in this oven in the method in **independent claim 1**, the reaction oven to be operated in a temperature range between 200°C and 230°C in **claim 2**,

Tarhan et al (US 4124685) disclose the reversible reaction of the Claus process cannot, furthermore, be completed to the right of the equation because of limitations of the thermodynamic equilibrium at temperatures above 250°C (Col. 3, line 25-31). It would favor to have temperature below 250 °C.



As to wherein the process gas that leaves the reaction oven, after precipitation of the condensed sulfur is passed back into the coke oven gas to be cleaned, ahead of the gas scrubbing, with a residual content of hydrogen sulfide that was not converted in the reaction oven in **independent claim 1**, as shown in the Figure 3, line 199 which reads on the limitation as claimed.

As to wherein a boiler lined with a refractory material, lying horizontally, to be used as the Claus boiler which has a combustion chamber and a catalyst chamber having a catalyst bulk material, which follows horizontally and being delimited on both sides by gas-permeable checker bricks in **independent claim 1**, it would be obvious to have refractory material because chosen known material for suitability renders obvious. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). As shown in the Figure 3 above, the boiler, burner (combustion chamber) and gas phase reactor (catalyst chamber) are together horizontally, it also would be obvious to have boiler and gas phase reactor lying horizontally because rearrangement of parts. *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975). Tarhan et al (US 4124685) disclose the partially oxidized gas now containing SO<sub>2</sub> as well as H<sub>2</sub>S and CO<sub>2</sub> Claus Reactor 179 where it is catalytically reacted to form more elemental sulfur and water in accordance with reaction 1 (Col. 17, line 50-52). It would contain a catalyst bulk material for the catalytic gas phase reaction. It would be obvious to have containing means to hold the catalysts as evidenced by Luinstra et al (GB 2221853A) that Claus reaction furnace has a refractory material having a working temperature of at least 1100 °C which supports for holding catalytically active substance (Abstract, page 4, line 1-3). Tarhan et al, Luinstra et al **do not teach** the checker bricks for the delimiter (wall) as claimed.

However, Hyde (US 4940081) **teaches** checker brick (Title). It relates to the art of refractory bricks and, more particularly, to checker bricks used for recovering heat in recuperators.

The advantage of checker bricks as wall is to have optimum heating surface area and that is relatively simple to manufacture and install (Col. 1, line 8-10).

Therefore, it would have been obvious to install the checker bricks of Hyde for the wall to support the catalyst disclosed by Luinstra et al in the gas phase catalytic reactor of Tarhan et al in order to attain the advantage cited above.

As to waste heat boiler having 1<sup>st</sup> tube bundle composed of heat exchanger tubes, through which the process gas that exits from the Claus boiler flows, that the waste heat boiler has a second tube bundle composed of heat exchanger tubes, through which the process gas that exits from the reaction oven flows, and that the tube bundles are disposed in a common steam generator chamber, in which low-tension steam is generated in **claim 4**, Tarhan et al (US 4124685) disclose boiler 243 which makes use of combustion and also the heat of reaction of H<sub>2</sub>S and SO<sub>2</sub> in the thermal reactor 242 to form steam 247 from boiler feed water 245, heat exchanger or cooling coils 251 and 263 in Figure 4 above. It is well known in the art that heat exchanger has design tubes in the art. Tarhan et al do not disclose combining two heat exchangers disposed in a common steam generator, it would be obvious to have them together in one chamber as well as separated in two units because rearrangement of parts renders obviousness. *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

As to elemental sulfur being drawn off from waste heat boiler in liquid form in **claim 5**, Tarhan et al (US 4124685) disclose the hot gases and entrained sulfur vapor to be passed through line 249 to a heat exchanger or cooling coil 251 where the gases are cooled sufficiently to condense the sulfur vapor to molten sulfur which is then collected in sulfur collecting tank 253 (Col. 19, line 18-23).

(3). **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tarhan et al (US 4124685), in view of Hyde (US 4940081), further in view of Heisel et al (US 5628977A)

As to a partial stream being branched out of the hot process gas that leaves the Claus boiler and mixed into the process stream that is passed to the reaction oven to heat it in **claim 6**,

Tarhan et al (US 4124685) disclose the heat exchanger 257 as shown in Figure 4 above. Tarhan et al **do not teach** the mixing of stream of waste gas from Claus furnace with process stream that is passed to the reaction oven as claimed.

Heisel et al (US 5628977A) **teach** process for the desulfurization of a crude gas containing H<sub>2</sub>S (Title). A part of the Claus reactor waste gas is limited quantitatively by control valve 14 on pipe 13, drawn off hot from Claus furnace, while the residual Claus reactor waste gas is cooled by evaporation of boiler feed-water 15 and drawn off via pipe 18. The steam generated by evaporation of boiler feed-water accumulates in pipe 16. With the cooling of condensed elementary sulfur, it is drawn off via pipe 17 from Claus furnace 12 (Col. 6, line 25-34). The Claus furnace waste gas at hand in pipe 21 after cooling 19 is mixed with hotter Claus furnace waste gas from pipe 13 and fed via pipe 22 to catalytic reactor 23. Control valve 14 is adjusted in this case in such a way that the gas stream in pipe 22 has a temperature of 170 °C to 220 °C (Col. 6, line 37-42).

The advantage of missing two waste gas streams is to adjust gas stream in pipe 22 has a temperature of 170°C to 220°C (Col. 6, line 37-42).

Therefore, it would have been obvious at time of the invention to have branch of waste gas from Claus furnace to mix with waste gas to the catalytic oven disclosed by Heisel for the gas stream to the catalytic reactor of Tarhan et al in order to obtain the advantage cited above.

### ***Response to Arguments***

(4). Applicant's arguments, see pages 2-10, filed on 10/30/2009, with respect to the rejection(s) of claim(s) 1 under 103 in view of combined teaching of Heisel et al (US 5628977), Tjoa et al (US 3767766), Keller et al (US20020134706A1) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Tarhan et al (US 4124685), Luinstra et al (GB 2221853A), Hyde (US 4940081).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

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Date: December 29, 2009

/Duane Smith/  
Supervisory Patent Examiner, Art Unit 1797